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ABSTRACT

Two naturalistic research studies observed 45 eleventh grade students carrying out research paper assignments, and a third such study focused on 26 third grade students. The studies took place in Alberta (Canada) in 1993, Texas in 1996, and Washington state in 1999. From data analyzed in the interviews and written documents, the initial findings indicated that third grade and eleventh grade students feel and think about research writing activities similarly. The younger students seemed more process oriented than the older ones. The third grade students commented on enjoying reading the information on their topic and telling the facts they had learned. The older students used methods of citation and more sophisticated paraphrasing techniques. The younger students did not use any citations. The amount of blatant copying for the Texas study and the Washington study were comparable. The mental models of both age groups were surprisingly similar. (Contains 15 references.) (Author/MES)

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Treasure Hunt or Torture

Student's perspectives on research projects.

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Two naturalistic research studies observed forty-five eleventh grade students carrying out research paper assignments and a third such study focussed 26 third grade students. The studies took place in Alberta (Canada) in 1993; Texas (USA) in 1996; and in Washington state (USA) in 1999. From data analyzed in the interviews and written documents, the initial findings indicate that third grade and eleventh grade students feel and think about research writing activities similarly. The younger students seemed more process oriented than the older ones. The third grade students commented on enjoying reading the information on their topic and telling the facts they had learned. The older students used methods of citation and more sophisticated paraphrasing techniques. The younger students did not use any citations. The amount of blatant copying for the Texas study and the Washington study were comparable. The mental models of both age groups were surprisingly similar.

Introduction

Near the end of a school year, students were asked, "What was the best thing about your experience?"

One student sighed with relief as he replied, "It's over. I'm done. I won't have to do **that** again." Was the experience to walk the plank? To read the entire encyclopedia set? To calculate pi? What could be so awful that it was a relief to have finished the experience?

Another student cheerfully replied, "All the stuff I learned." Was this her summary of an outstanding school year? Was the experience the result of a masterfully taught lesson? Had she read a great nonfiction book? What experience resulted in so much learning?

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This question was asked of students who had handed in their research reports. These responses are typical of students assigned research papers, reports, or projects. Students feel that research assignments can be both a treasure hunt and pure torture.

Research papers have become an integral part of today's curriculum for students of all ages in North America. With the push toward developmentally appropriate curriculum, primary students in kindergarten through third grade have been considered too young to be required to manage such a monumental task (Bredekamp, 1987). Yet, the push toward academic accountability and changes toward resource-based learning requires younger and younger students to be engaged in library research. School librarians/library media specialists all over the world are asked about resources with low reading levels. "Do you have a fact filled book on rain forests with a first grade reading level?" Some teachers feel that teaching young children research skills gives them more time to perfect the skills before high school and college where the research paper is a mainstay. Other teachers feel that exposure to research projects at an early age is a great way to involve parents.

Research Questions

What do young children learn from research assignments? Do students construct their own understanding of content matter during a research assignment? Do students at different cognitive stages think about research differently? What thinking skills do students use during each phase of a research project? What are the mental models of third grade students? Does plagiarism occur when there is primarily a product orientation rather than a combination of product/process orientation? Are younger students more process oriented?

Theoretical Background

Piaget first observed and investigated children building their own knowledge of the world in the 1920s. His constructivist theory can best be summarized by this statement, "...knowledge of reality must be discovered and constructed by the activity of the child" (Ginsburg & Opper, 1969, 14.) Several researchers in the field have used constructivist theory to provide a framework for their work. Kuhlthau (1993) investigated children's physical and mental activity during information use. This research focused on the student's ability to construct understanding rather than simply acquire knowledge. Tastad and Collins (1997) used constructivist theory in their research with information use and the writing process. A constructivist philosophy was found to be more productive and even necessary to teach the process of using information and writing.

The mental model is a psychological and scientific concept employed to understand the human thought process (Gentner & Stevens, 1983). Johnson-Laird (1983) defined mental models, "...human beings understand the world by constructing working models of it in their minds" (p. 10). Students of all ages construct mental models of concepts and processes throughout their educational experience. Several researchers in the field of library and information studies have explored mental models. The mental models of administrators, teachers, school library media specialists, and student's of all ages have been the focus of

many recent studies (Mevorach & Strauss, 1995; Moore, 1998; Pitts, 1995; Tallman & Henderson, 1999).

Methodology

Two independent researchers have spent several years collaborating on a series of qualitative studies of a phenomenon from several perspectives in order to provide a broader scope of the problem. The phenomenon observed was that of students using information during a research writing assignment in a naturalistic setting. The populations were purposefully selected to enhance the likelihood of rich data. There was no control of any of the situations involved in the studies. The library media specialists at each site served as the gatekeepers for the research studies. The studies took place in Alberta (Canada) in 1993 (McGregor, 1994), Texas (USA) in 1996 (McGregor & Streitenberger, 1998), and in Washington state (USA) in 1999.

Previously, two naturalistic research studies observed forty-five eleventh grade students carrying out research paper assignments. One study explored student information use in general and probed the possibilities of the link between product orientation and plagiarism. This 1996 study in Texas grew out of a 1993 study in Alberta, Canada which generated a model of student thinking.

The selected samples provided the researchers with an opportunity to observe eleventh grade students writing research papers as part of their normal educational experience. The sites were chosen to provide as much similarity as possible, but the populations were different in several ways. The Canadian students were International Baccalaureate (IB) students whereas the American students comprised a more heterogeneous group. The Alberta sample was on the assumption that IB students might be able to describe their thinking most easily. The more heterogeneous Texas sample was selected to allow observation of a wider range of behaviors.

The Alberta study observed and interviewed students during the information collection phase of their research projects, and analyzed audio taped think-aloud protocols of their paper-writing phase. The Texas study observed and interviewed students throughout the information collection and writing phases. Data in both cases (research logs, notes, and final drafts of the research papers) were collected and analyzed, and sources of information were examined.

As a result of these two studies, a third exploration of this naturalistic research began in January 1999 with 26 third grade students. In a rural area outside of Seattle, Washington, USA. The single researcher's role was that of observer. The purpose of this study was to explore the role of cognitive development in mental models and information use.

As were the previous subjects, the students who were the subjects in this study were purposefully selected for their ability to verbalize their thinking. An interview of the subjects was followed by observation in the classroom as they entered the information collection and writing phase of the research project. Data collected included transcripts of interviews, field notes, student notes taken, webs, rough drafts, and final copies. All written documents were analyzed and written sources were examined.

The analysis of data in all three studies included the comparison of the students' final papers with the original sources of information. Due to teacher intervention in the form of emphasis on proper citation, the Texas group was very conscious of avoiding plagiarism and the need to cite appropriately. The Alberta group received little direction with respect to citation or plagiarism. The Washington group received no instruction on citation. The Texas students used a citation pattern nonexistent in the Alberta group's papers: they included many passages that were taken directly from the sources, parenthetically referenced, but not enclosed in quotation marks.

The Washington group presented an interesting situation. This group of younger children wrote reports about African animals. The information in the source was written very simply, for example, "Hippo skin is thick and tough." (Banks, 1990, p. 17). Third grade students possess limited writing skills to paraphrase that sentence. During analysis it became apparent that the students had either copied information word for word with no quotations or they attempted to paraphrase. For example, the information from the source above in the final paper read, "The Hippopotamus has thick tough skin." This attempt was considered copying because the original sentence pattern was not rewritten. Attempts at paraphrasing were considered copying due to the lack of evidence that the student understood the information.

The Texas students did not demonstrate the connection between paraphrasing and citing ideas in most of their papers. Citation errors in these passages suggested that students were simply scribing, trying to fulfill a requirement, and not thinking about the topic or about synthesizing information. Interventions based on format and rules seem to have some effect on limiting the amount of blatant copying but not on helping students learn from information or construct their own understanding.

Further data analysis in both the Alberta and Texas studies consisted of coding transcripts of the formal interviews. The coded transcripts were then scrutinized for patterns of mental models, process/product orientation, and information use. The results of the Alberta study led to a model of student thinking, which is currently being refined with the results of the Texas study.

Findings

In the Washington study, the initial analysis of interview transcripts and documents reveals interesting patterns of young children's thinking. The patterns emerging from the preliminary data analysis include: limited previous understanding of the topic, evidence of the mental models of novice learners, and process orientation. Further analysis will provide deeper understanding.

Children with vast amounts of differing experiences utilize concrete thought processes to make sense and store information (Ginsburg & Opper, 1969). Using a metaphor borrowed from Pitts (1995), third grade students do not have much of anything stored in their cognitive attics. At the ripe old age of nine most students have had limited life experiences. Certainly, in the population of this study the experience with African animals consisted of photographs, documentaries seen on television, and possibly a visit to the zoo. A majority of the students therefore had no concrete experience with the animal they were writing about. Some

students had first hand experience with pets or farm animals. Misunderstanding is likely to be possible when new information is acquired and used based upon the knowledge of a topic gained by looking at a photograph.

Their lack of life experiences and prior knowledge is evident in the reports written by third grade students. One student who obviously had limited experience with pregnancy, except the underlying truth that it takes a long time to have a baby, lacked the prior knowledge to correctly report the gestation period of elephants. She wrote, "Elephant babies are in their mothers stomach for 4 whole years." The source text stated that elephant cows were pregnant for 21 months (Overbeck, 1981). One would think that applying some mathematical calculation would have adjusted the student's thinking. However, division is typically only an introductory concept in third grade. The student did not have enough prior knowledge to accurately paraphrase the source and build new understanding.

Unorganized and fragmented understanding are characteristics of novice learners (Pitts, 1995, 178). Mental models constructed on a novice knowledge base have accurate and inaccurate personal understandings. An analysis of the research reports on African animals reveals that some third grade students had an unorganized and fragmented understanding. Paragraphs were written with facts on different aspects of the animal chained together: "Monkey's usaly eat fruit, leaves, seeds, buds, bark, and stems. Mostly Monkeys eat fruit. Some monkeys live on ground like baboons and chimps. Most live in trees. Some Old World monkeys have flat noses." The student listed many types of plant material that monkeys eat, yet the understanding of the student was that monkeys mostly eat fruit. This personal understanding was probably based on the media created notion that monkeys eat bananas and there were oranges in the cage at the zoo when the student visited. The student's understanding is shown to be clearly fragmented particularly when referring to the original source information that was found on pages 22, 10, 11 (Barrett, 1988). The information was presented in an organized format and the notes written from the source followed the organization for the most part. The student created a web from the notes which grouped all of the facts relating to food were around it. In writing the report, the student presented the facts in an unorganized and fragmented manner. This student has a mental model of monkeys that continues to lie on the novice end of the continuum (Pitts, 1995, 178).

The mental model of an expert has complex and organized understandings of the topic (Pitts, 1995, 178). Students were asked if they considered themselves experts after spending two weeks gathering, organizing, and reporting information on the topic. Most students said no, they wouldn't consider themselves experts because they didn't understand the animal well enough. After a few probing questions, the students revealed that they might know more than their peers and certainly they knew more about the animal than before reading the sources.

Process orientation is reflects the students' enjoyment and focus on the information, the learning, and the task of doing research rather than on the finished product or the final grade. The third grade students in this study enjoyed reading for information about the animals, working in groups during the note taking phase, and using computers at home. A majority of the students said they liked reading all the books, magazines, and computer print outs about the animals. The task that they liked the least was editing the rough draft and making the

final copy. Clearly students enjoyed the research process much more than creating the product.

Another example of process orientation was the lack of concern or awareness that the report would be graded. The researcher had to ask students and the teacher if the reports were graded. The teacher replied, "Oh, yes!" A question was then put to the students, "If you could give yourself a grade on this report, what grade would you give yourself?" Several students did not know. They could not fathom giving a grade or earning a grade. A majority of students gave themselves the equivalent of a B. They felt they had written a good report but that it would have been better if the conventions (spelling, capitals, and punctuation) were better or there was more information in the report. Overall, there was a general disinterest in grades or the finished product. Most students were focused on the research process of reading for information.

The most significant evidence of process orientation is the lack of blatant copying by third grade students. A comparison of the written reports to the original source material revealed very little plagiarism. More than half of the papers had less than 15% of the written material copied. A majority of the papers were 100% "kid language, " i.e., completely in the students' own words. Third grade students showed they had used the information and made sense of it constructing their own understanding of African animals.

Some of the similarities and differences noted in the thinking of students in the Washington study became evident when compared to students in the Texas study. Third grade student's mental models were compared to eleventh grade student's mental models using responses to interview questions. Another comparison of both groups written papers showed some initial differences. The amount of plagiarism committed by both groups in the form of copying was compared only quantitatively. Further qualitative analysis will reveal more similarities and differences.

Responses to interview questions allowed comparisons between the third grade students'mental models and the eleventh grade students' mental models. Another comparison of both groups written papers showed some initial differences. There was only quantitative comparisons of the amount of plagiarism committed by both groups in the form of copying. Further qualitative analysis will reveal more similarities than differences.

The researchers also used transcripts of interview questions to compare the mental models of third grade students and eleventh grade students. Both the Texas group and the Washington group were asked, "What is research?" and "What is a research paper?" These open-ended questions were designed to allow the student's thinking to emerge. The questions were asked either before or at the very beginning of the research study.

One third grader described research as follows: "Like if you need to do a report on something you got to research in books and stuff. Like if you had to research on like, boats and stuff you could get, like a Titanic book and look how it did everything and write down how it did stuff." An eleventh grade student's mental model of research was similar: "...looking up, finding out information about the past, or something that has been going on. And, um, finding out as much as you can about it, and putting it in to a way that people can read it and understand it. And know about it." Both students described research as a process involving information collected from sources and then writing down the information for a purpose.

The mental model of research papers from both groups seems to emphasize the written product. A third grade student explained that research is " something that you study and do a report on." Similarly, an eleventh grader mused that a research paper was: "... kinda hard to explain. Like, all the information on paper, you just put it into a format, so it's a really easy paper." Both age groups' mental models include using information in the writing process. Even though the older student emphasized the format and structure of the paper the basic definition is parallel.

Some differences were not age specific but were due to teacher interventions. During the Texas study, teachers told the students to take notes on note cards by copying directly from the source. In the Washington study, the teacher modeled note taking on a piece of paper paraphrasing the source text with a different fact on each line. It was evident that the students who took notes from source material by paraphrasing were less likely to copy than students who copied the source text verbatim.

During analysis of the note taking pages it was often difficult for the researcher to determine which source had been used. The sequence of information usually determined the source. A third grader took the following notes about camels: "lazy, mean, stuiped; spits; tamed in 2,600 B.C.; mite be exstenct; fewer then 1,000; sharp theeth; strong lips; can eat thorns." The only information from this section of notes that was included in the final draft was the fact that camels eat thorns. The final report read, "The camel can eat many things like thorns, cactus, grass, and anything it can get to." The paraphrasing, including the misspelled words, indicate the student's making sense of the information. If the student were merely scribing, that is, copying straight from the book on to the paper without any thought process, the words would more than likely have been spelled correctly.

Conclusions and Implications

From data analyzed in the interviews and written documents, the initial findings indicate that third grade and eleventh grade students feel and think about research writing activities similarly. Teachers led students through an educational process that produced a piece of writing. The piece of writing should contain a synthesis of the information learned during the educational process. Curiously, the initial research experience for the group of third grade students was not much different from the experience of eleventh grade students. For some of the eleventh grade students their experience was their initial research paper. Something is definitely lacking in educational experiences if students begin and end them without significant growth. Teachers, researchers, and library media specialists should be mortified that between third and eleventh grade students do not gain sophistication in their use of information and writing.

The younger students seemed more process oriented than the older ones. Primary teachers should be commended for emphasizing the process. The third grade students commented on enjoying reading the information on their topic. The students enjoyed telling the facts they had learned about African animals.

Creative and alternate ways of reporting the information could be advantageous to students with limited writing skills. The older students used methods of citation and more sophisticated paraphrasing techniques. The younger students did not use any citations. The

amount of blatant copying in the Texas study and the Washington study was comparable. Students can be taught to use citation styles and paraphrasing techniques to successfully minimize copying. The implications of this finding could ultimately bring changes to curricula at all levels. Students are capable of building an understanding of a topic and communicating the synthesized information to others.

The mental models of both age groups were surprisingly similar. Students have not progressed very far on the continuum from novice to expert in eight years of educational experience. Comparing mental models of "expert" information users to "novice" information users could be fruitful. Action research cooperatively undertaken by school library media specialists and teachers could broaden the understanding of mental models of students at different ages and stages of cognitive development. Research involving mental models, use of information, and plagiarism will continue to influence educational practice. Developing theory from qualitative studies will lead the way into the next century.

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